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THE TREATMENT OF TANK OFFAL

—AND—

Presented by
the Author

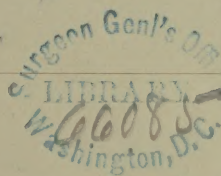
The Gases from Rendering Tanks.

With a description of some of the processes in operation in Chicago.

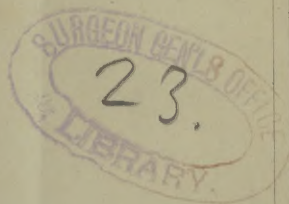
BY

DR. BEN. C. MILLER,

Sanitary Superintendent.



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TREATMENT OF TANK OFFAL

AND THE

Gases from Rendering Tanks,

*With a description of some of the processes in operation in Chicago.**

By DR. BEN. C. MILLER, Sanitary Superintendent.

To sanitarians, and indeed to the citizens of all large cities, the questions how to care for animals, how to kill them, and the proper method of caring for the products of slaughter houses, are exceedingly grave ones; questions that not only concern the health of the community, but the comfort of individuals.

In considering the business of slaughtering and the care of the products, I shall refer to the manner in which it was conducted in Chicago up to 1865, mention the improvements made since that time, and give descriptions of some of the apparatus now in use.

At the period referred to, live stock was received at the different yards in the city; the principal ones being at Twenty-second street. The accommodations were not first class, the pens were not planked in many cases, and the animals were compelled to stand in the mud.

In 1865 the new yards of the Union Stock Yard Company were completed, and the cattle, etc., were subsequently received at that point. The entire yards were drained as well as the nature of the ground would admit, the roadways and alleys macadamized, and the pens for cattle planked; while those for sheep and hogs were in addition roofed to protect them from the weather. Water is furnished throughout the yards from an artesian well. The superintendent, Mr. John B. Shennan, who is absolute in authority, has a large force constantly employed in taking care of the pens and keeping them clean, every effort being made to render the animals comfortable.

Inspectors pass through the yards constantly, and all maimed and diseased cattle found are not permitted to leave, but are killed and sold to a company who own a rendering establishment on the Calumet

* Read before the American Public Health Association, in Philadelphia, November, 1874.

river, some twenty miles from the city, whither the carcasses are taken and rendered for their fat. In this way maimed and diseased animals are prevented from going into the market and being sold for food.

The following table shows substantially the number of animals received during each of the first three years after the opening of the yards:

Hogs,	.	.	.	.	688,140
Sheep,	.	.	.	.	179,880
Cattle,	.	.	.	.	330,301

While in 1873 the receipts were as follows:

Sheep,	.	.	.	.	291,734
Hogs,	.	.	.	.	4,337,750
Cattle,	.	.	.	.	761,428

An increase of 4,199,581.

Previous to 1865 nothing had been done towards the care of gases generated in the rendering tanks. In many houses closed tanks were not in use, the cooking being generally done in open kettles; and when tanks were used, the gases and steam were permitted to escape into the open air, and the offensive odors were carried by the south-west wind over the city. Every year brought to the city a large increase in the number of animals received, and a corresponding increase in the number and capacity of the packing houses, with attendant disagreeable odors. Nothing had been done to utilize the tank refuse when removed from the tanks; the only question was how to get rid of it. Before the river was frozen, boatloads of it were dumped into the lake several miles from shore; and when navigation closed it was buried on the prairies, giving variety to the city smells when the summer warmed it up.

The quantity of tank refuse or offal a single season will yield can be readily estimated when it is known that an ox or a cow gives 50 lbs., a hog 20 lbs., and a sheep 7 lbs. The total amount cared for during 1873 was 22,784,360 pounds.

The first effort made toward the disposal of the gases was in the form of a regulation of the Board of Health, compelling the use of tanks from which the steam passed through a coil of pipes into a condenser, and thence, with a portion of the gases, into the street sewer.

This was a marked improvement over the old way, but was not at all satisfactory, since the gases escaped through the man holes in the street sewers into the atmosphere. In some of the houses the steam and gases were passed into the chimneys and thence into the air. This was all that was done in this direction; but steps had been taken to care for the tank refuse.

Baugh's dryer (see Plate I, Fig. 1) was procured by one company, and an attempt made to turn the refuse into a fertilizer. It was successful so far as the drying was concerned, but the odors emitted from the smoke stacks were unendurable, and the company's works were indicted as a nuisance.

This drying machine consists of a revolving cylinder thirty feet long and three feet in diameter, inside of which is an axle with three arms or agitators equidistant from one another, which revolve in the same direction as the cylinder. The heat is supplied by several fire places underneath, and also by a current of hot air which passes through the cylinder. When in position that end is highest where the material is fed into the machine; the refuse coming in contact with the agitators and hot air, it is kept constantly in motion until it passes out at the other end in a dry state. The material runs through in about five minutes, and from one to two tons can be dried in an hour. The gases generated during this process pass into a condenser and thence into a chamber (a comparatively new invention), the temperature of which is 2100 degrees. Here they meet a flame and dripping hydro-carbon oil, and, as claimed, are burned, the residuum going up the chimney. My observations of the working of this machine have extended over a period of two years, and in my opinion the dryer cannot be used without giving offense unless the gas chamber is added and kept in perfect order. When not connected with the dryer the volume of smoke and steam passing through the chimney is enormous; when it is used, scarcely any smoke is noticeable, and the disagreeable odor is lessened to such an extent that the drying process can be carried on without giving serious offense.

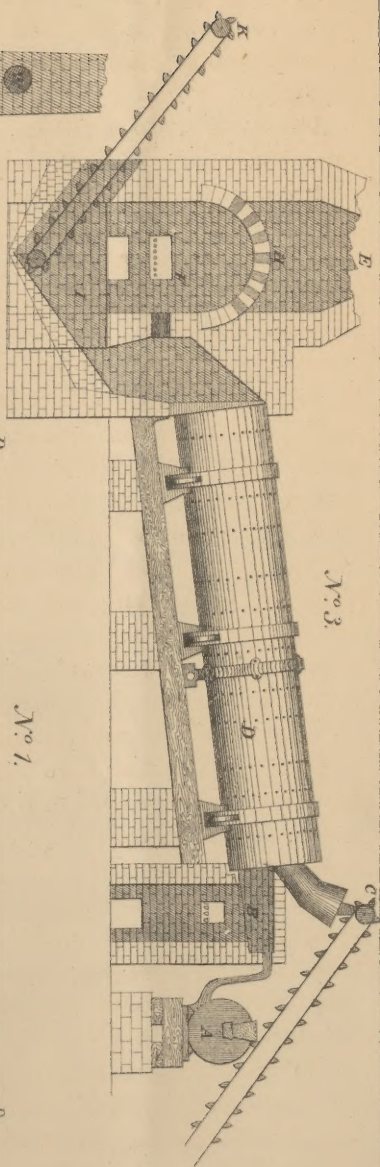
Another apparatus used at several of the packing houses, for manufacturing the refuse into a fertilizer, is known as Edwards' machine (see Plate No. 2). It consists of a cylinder, varying in size according to the work to be done, with a chamber underneath in which air is heated and passed through an inner plate into the cavity of the cylinder where it comes in direct contact with the material.

In the centre of the cylinder is an axle with extending arms, the axle being revolved by machinery, and keeping the refuse in constant motion. The heat is applied under the cylinder, none entering it except a small quantity which escapes through the openings in the heated chamber.

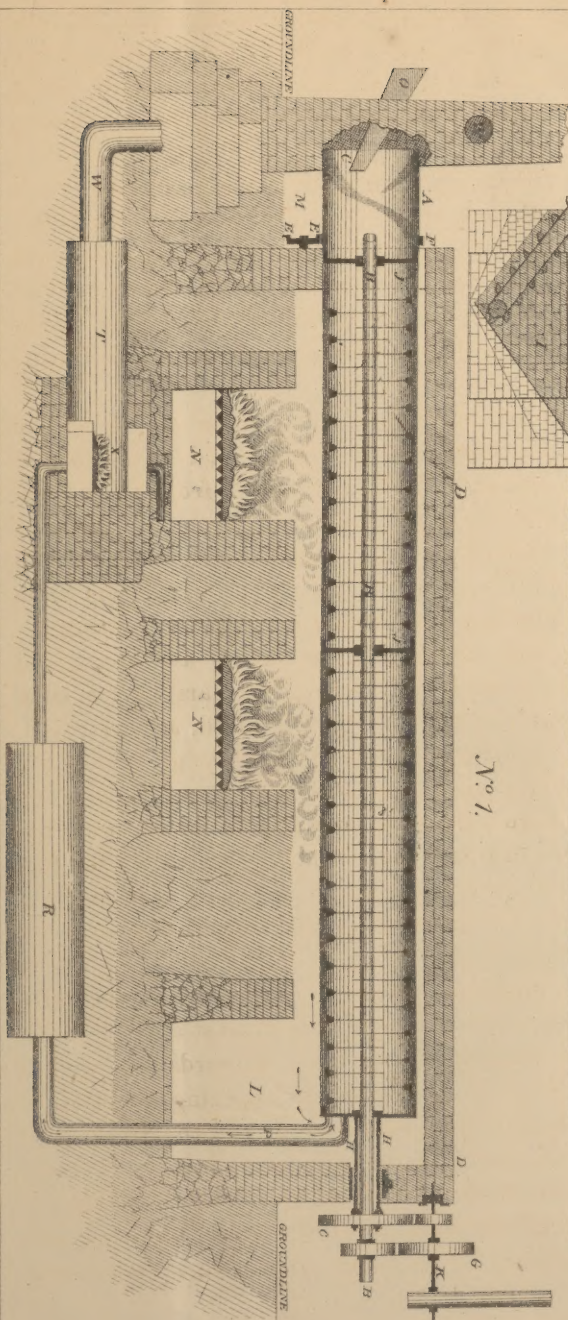
About one and a half tons can be dried at a charge, taking about three hours. As originally constructed, no provision was made for destroying the gases, which were permitted to escape into the open air. Lately, however, the owners of the machine have attached Bradley's process for destroying the gases, and also added escape pipes to the rendering tanks, those connected with the sewers having been discontinued.

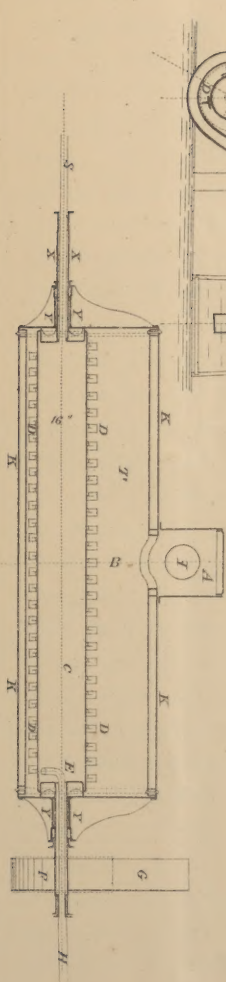
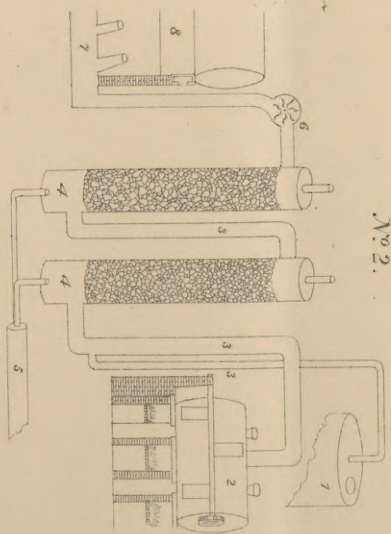
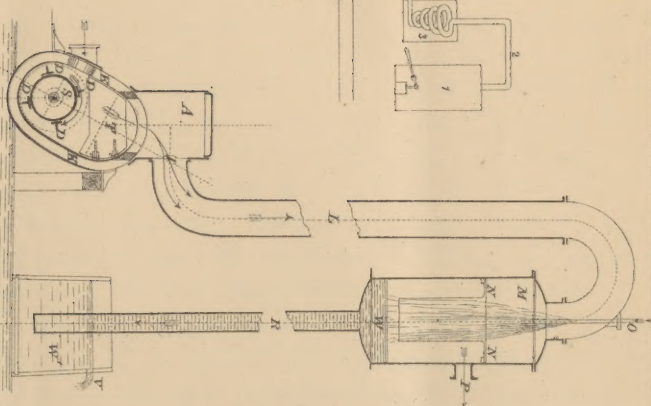
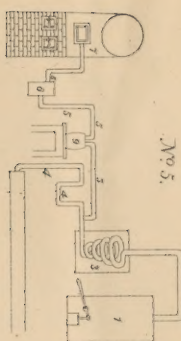
Bradley's process consists of a pipe leading from the dryer and tanks to an upright boiler thirty feet in height, filled with brick so placed that water can percolate freely and escape from the bottom into a pipe connected with the sewer. From the top of the boiler a large pipe leads to the base of a second upright boiler, which is also filled with bricks in the same manner as the other. Extending from the top of the latter boiler is a pipe leading to a rapidly rotating fan which draws the gases and steam from the dryers and tanks and drives them into a chamber underneath the grate bars or furnaces, where they pass through the fire, and, as is claimed, are destroyed. In passing through the boilers, the steam and vapory portion of the gases are brought in contact with a stream of water which flows through the bricks, and are condensed, escaping ultimately with the water into the sewer, the dry gases only being driven under the furnace. I cannot state fully the merits of this machine, as it has been in use only a short time; but that it is a great improvement over the old method there can be no doubt.

Another method is known as Storer's. This dries differently from either of those described. Baugh dries by heat applied externally, hot air passing through the machine; Edwards also applies heat externally, but adds a hot air chamber with openings which allow the hot air to come in contact with the material. In the Storer patent, heat is applied on the inside of the cylinder by using pulverized fuel, the offal coming in contact with a flame and being dried rapidly in a temperature ranging from 2300 to 2700 degrees, the large percentage of water (from 50 to 75 per cent.) preventing it from burn-



No. 1.





ing. This machine (see Plate I, Fig. 3), which will dry about ten tons of raw material an hour, consists of a brick-lined cylinder varying in size according to amount of work to be done, placed on an incline having at one end a fire place and at the other a smoke stack. Underneath are friction rollers, on which it revolves.

The material is fed into the furnace end by an elevator, where it encounters the pulverized fuel, and going rapidly through it comes out at the base of the smoke stack, and there it is conveyed away through another elevator. Passing through such intense heat and drying so rapidly, enormous quantities of steam and gases are evolved. These are carried into a combustion chamber at the base of the stack. This chamber is an inverted cone, perforated, and opens into the smoke stack. At the bottom of the cone is a grate on which is a coal fire. Above the fire, through an opening in the side of the cone, a jet of the pulverized fuel is projected, igniting as it enters and keeping the chamber at a white heat. By the passage of the gases through the chamber and the grate it is claimed that they are destroyed.

This machine has been in operation for two years, and has given general satisfaction. Many experiments have been made to test the thoroughness of the destruction of the gases, and all were very satisfactory, even a wet blanket placed over the smoke stack to dry retaining no odor; and it was demonstrated that if the gases were passed through a sufficiently high temperature, they were neutralized or destroyed.

The latest machine put in operation is known as the Tobey dryer (see Plate II, Fig. 4). It consists of an oblong cylinder twelve or fifteen feet in length, made of boiler iron, and so constructed as to surround the material with a steam jacket. Inside is another cylinder, hollow and some sixteen inches in diameter, covered with teeth, which comminutes the offal and facilitates the drying process. The cylinders are heated by the surplus steam from the boilers used in the packing house proper. The dryer is fed by a contrivance which supplies a given quantity at a time, the material passing through in about ten minutes. On the top of the outer cylinder is a dome, through which the gases pass upward to a pipe leading to a condenser composed of a chamber and a copper pipe with a blind end, perforated with hundreds of minute holes.

The steam and gases entering the chamber come in contact with fine streams of water trickling from the perforations and the steam

part of the gases is condensed, and escapes with the water into the street sewer.

This apparatus has not been long in use and one of its most valuable features seems to be in the economy of working. It can be operated by the surplus steam of a packing house, and its capacity is such that the offal can be disposed of as fast as the fat is removed from it, thus preventing accumulations and permitting no material to grow rancid.

This includes the more prominent machines (with the exception of the Hogel machine which is heated by steam) in use in Chicago for the purpose indicated.

By the use of the above machines the tank refuse can without doubt, be cared for without giving serious offense, but to do so the utmost vigilance is required in working the different processes. That the work will be done without offense to the public, there can be no doubt, for the material is too valuable to lose, and the Chicago public, from the past improvements are satisfied that the work can be done without offense and will insist on its being done so.

In considering the above processes I have spoken incidentally of the escape pipe of the rendering tanks being attached to the Bradley condenser and the destroying of the gases in the furnaces.

It is claimed that the combustion chamber of Baugh or Storer will destroy the tank gases if the proper connections are made.

THE GASES FROM RENDERING TANKS.

After the Board of Health compelled the use of closed tanks and the use of condensers, many experiments were made looking towards the destroying of tank gases.

Among the successful ones was the experiment of Mr. James Turner which resulted in Turner's patent, (Plate II, Fig. 5) which carbonizes the gases and destroys them. After the steam is condensed, the gases are carried off by a pipe to an iron tank, fifty feet from the building where they pass through gasoline or other hydro-carbon oils, and are brought back to the furnace and burned under the boilers. The amount of gases generated from the tanks used in a large packing house is sufficient, after being carbonized, to generate a large quantity of heat, and will by this method save a large percentage of fuel.

That these gases can be burned in the open air without offense has been frequently demonstrated to the writer and others, and at present the patentee is placing a gasometer in connection with his carbonizer

in which the gas will be stored in sufficient quantities to light the packing house.

That each year brings improvements in the packing houses and diminishes the number of nuisances both in quantity and intensity is evident. The packing house of to-day is totally different from that of ten years ago.

Aside from the improvements in caring for refuse and gases, much has been done in other directions. The sewerage is now looked after and every effort is made to have perfect ventilation, both by external windows and by mechanical means of the latest and most approved plans. In the place of wooden floors in the cellars, stone floors have in some of the recently erected houses been substituted.

Packers have learned that the more perfect the arrangements of the house, the more fully sanitary requirements are met, more work can be done and a better class of meat cured.

I think the management of some of the houses has demonstrated that they can be conducted without serious offense, and if in the future improvements progress in the same ratio as they have progressed in the past six or eight years, and packers take an interest in adopting them and doing their work well, there will be slight cause for complaint against packing houses.

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